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MHD numerical simulations of nanojets and nanoflares in the solar corona for MUSE

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The solar corona shows inexplicably high temperatures, up to million degrees, when compared with the cold lower photosphere. The conversion of magnetic energy into thermal one through the magnetic reconnection has been chased for the last decades as the mechanism to explain this phenomenon. The reason why such mechanism remains elusive is because reconnection events are singularly too small and fast to be detected (nanoflares), whereas their collective action is sufficient to sustain the million degrees corona against thermal conduction and radiative losses.

The forthcoming MUSE mission of NASA, a new high cadence high resolution EUV spectrometer will be launched in 2027 with the aim of unveiling such elusive phenomena.

The strategy of the mission is to couple high cadence high resolution observations of coronal loops (arch like magnetic structures where the plasma is confined) with state-of-the-art numerical simulations which can synthesise MUSE observables and disentangle observations otherwise too dynamic and complicated to be understood with traditional inversion methods.

We perform magnetohydrodynamics (MHD) simulations of the dynamic counter part of nanoflares, i.e. the nanojets a byproduct of the magnetic reconnection.

We analyse the relationship between the nanoflare and the nanojet, explaining how the latter, when observed, could give away the occurrence of the former.

Our 3D MHD simulations are key to bridge the gap between idealised magnetic reconnection models and future MUSE observations.

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